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PENSOFT

First record of *Molossus pretiosus* Miller, 1902 (Chiroptera, Molossidae) for the Cerrado of Bahia, northeastern Brazil

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Abstract

Molossus pretiosus Miller, 1902 is known from two localities in Brazil: one in the Caatinga of Minas Gerais, and other in the Pantanal of Mato Grosso do Sul. We report here the first record of *M. pretiosus* for the Cerrado of Bahia, Northeastern Brazil. This record extends the distribution of this species by about 200 km northward.

Keywords

Range extension; distribution; Cerrado; morphology.

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Introduction

The Chiroptera is one of the most diverse mammal orders, representing about 20% of all mammals in the world, comprising 20 families and more than 1300 species (Fenton and Simmons 2014). In Brazil, the order comprises 9 families, 68 genera and 178 species, making Brazil the second-highest rate of species richness of bats in the world (Nogueira et al. 2014). With the development of new sampling methods, systematic reviews and description of new species, the wealth of bats known in Brazil is constantly increasing (Tavares et al. 2008, Paglia et al. 2012, Nogueira et al. 2014). Nevertheless, the available information on the occurrence and distribution of bat species in the country are heterogeneous and fragmented, without any record of species in about 60% of the Brazilian territory, and only 8% of the territory minimally surveyed for bats (Bernard et al. 2011b). Although there are records of bats in 41% of the Cerrado biome, the western region of Bahia state is poorly surveyed (Lapenta and Bueno 2015).

The genus *Molossus* is widely distributed through the Americas, extending from Mexico to Argentina and Uruguay (Eger 2008). Members of the genus can be identified in the field by the presence of one pair of inferior incisors and non-caniniform upper incisors (Barquez et al. 1999). Additional diagnostic characters of the genus are the smooth lips, short and rounded ears arising from the same point, an antitragus constricted at the basis, and the absence of a prominent medial ridge at the snout (Eger 2008). In Brazil, the genus comprises 6 species (Nogueira et al. 2014): *Molossus aztecus* Saussure,

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1860; *Molossus coibensis* Allen, 1904; *Molossus currentium* Thomas, 1901; *Molossus molossus* (Pallas, 1766); *Molossus pretiosus* Miller, 1902 and *Molossus rufus* É. Geoffroy, 1805. Miller's Mastiff Bat, *M. pretiosus*, is a medium-sized species described as a "nonforest dweller that occupies open areas such as grassland savannas, dry woodlands, and cactus and thorn scrub" (Jennings et al. 2000: 2). The type locality of the species is the city of La Guaira, Distrito Federal, Venezuela, and the species occurs from Mexico and Nicaragua southward to Colombia, Venezuela, Guyana and Brazil (Dolan 1989, Jennings et al. 2000, Simmons 2005, Peracchi et al. 2011). In Brazil there are confirmed records in Aquidauna, state of Mato Grosso do Sul (Gregorin and Taddei 2000) and Jaíba, state of Minas Gerais (Nogueira et al. 2008). This study presents the first record of *M. pretiosus* for the state of Bahia, northeastern Brazil.

Methods

The specimen representing the first record of *Molossus pretiosus* for the state of Bahia was captured during fieldwork in the municipality of São Félix do Coribe, within the Cerrado biome. The climate on the sampling site is dry, with less than 60 mm of precipitation in winter, and is characterized as Aw (Kottek et al. 2006). The specimen was captured in a set of 7 ground level mist-nets and 1 elevated mist-net (4 m high) on a dirt road that separate an agriculture area from a savanna fragment. The nets remained opened for 6 h after sunset.

The identification of the specimen and the selection of the qualitative and quantitative traits used in the comparisons were based on Gregorin and Taddei (2000), Jennings et al. (2000), Lim and Engstrom (2001), Gregorin and Taddei (2002), Nogueira et al. (2008), Díaz et al. (2016), and López-Baucells et al. (2016).

The specimen was fixed in 10% formalin and preserved in 70% alcohol, and the skull was removed and cleaned. Using a digital caliper, the following external and cranial measurements were recorded according to Nogueira et al. (2008) and Velazco et al. (2010): forearm length (FL), greatest length of skull, including incisors (GLS), condylobasal length (CbL), condylo canine length (CcL), postorbital breadth (PB), zygomatic breadth (ZB), braincase breadth (BB), mastoid breadth (MB), maxillary toothrow length (MtL), breadth across molars (BaM) and breadth across canines (BaC). For a more detailed description of measurements see Velazco et al. (2010). The material is deposited in the Coleção de Mamíferos Alexandre Rodrigues Ferreria, State University of Santa Cruz (CMARF).

Results

New Record. Brazil, Bahia, São Félix do Coribe (13°19′S, 043°58′ W), Vinícius C. Cláudio, 17 July 2017, CMARF 0992, 1 specimen.

One neither pregnant (by palpation) nor lactating adult female of *Molossus pretiosus* was captured in the elevated mist-net. Many bats were seen foraging above the net at approximately 10 m height, and the single capture occurred 10 min. after sunset at 18.00h, when the individual of *M. pretiosus* dived on flight to capture an insect and could not avoid the net.

Figure 1. Female of *Molossus pretiosus* (CMARF 0992) from São Félix do Coribe, Bahia, Brazil.

Figure 2. Skull and mandible of *Molossus pretiosus* (CMARF 0992). A and B: dorsal and ventral views of skull (scale bar: 5 mm); C: mandible (scale bar: 4 mm); D: upper incisors with separated tips (scale bar: 1 mm).

Identification. The specimen presented general reddish coloration, face and membranes dark although not entirely black; fur on uropatagium reaching the proximal third; and dense ventral pelage on the wings at the region close to the body and forearm (Fig. 1). Dorsal furis darker than ventral, short (3.5 mm) and weakly bicolor with a reddish brown basal band (ca. 60% of fur length) and tips slightly darker. Ventral fur is also bicolored, short (3 mm), with a light brown basal band and reddish-brown tips, sprinkled with whitish hairs (Fig. 1). Dense fur on the base of the ears reaches 1/3 of its breadth, and the antitragus is oval with a constriction on the basis. There are long hairs on the feet (5 mm) and a few hairs longer than the fur over the dorsal posterior region of the body (16 mm). Skull is short and broad, with a well-developed sagittal crest and bulge braincase. The upper incisors are long and with separate tips; and the M3 has a V-shaped cusp pattern (Fig. 2). External and skull measurements are in Table 1.

The specimens was identified as *M. pretiosus* using data already reported for this species and by comparing data in the literature for similar species. According to Lim and Engstrom (2001), *M. pretiosus* and *M. rufus* can be distinguished from *M. coibensis, M. aztecus* and *M. molossus* by the unicolor dorsal fur. *M. pretiosus* and *M. rufus* differ from *M. molossus* and *M. currentium* by the forearm length usually longer than 45.0 mm and maxillary toothrow length longer than 7.0 mm. *M. pretiosus* is smaller than *M. rufus*, but there is an overlap in the forearm length (41.0–49.0 mm in *M. pretiosus*: 46.0–54.0 mm in *M. rufus*), GLS (19.2–21.3 mm; 20.6–23.7 mm in *M. rufus*) and MtL (7.2–7.7 mm; 7.4–8.2 mm in *M. rufus*; Gregorin and Taddei 2000, Jennings et al. 2000, Lim and Engstrom 2001, Gregorin and Taddei 2002, Nogueira et al. 2008, Díaz et al. 2016). Still, *M. pretiosus* has long

Table 1. Measurements (mean ± standard deviation) of *M. pretiosus* from Bahia, and comparison with females of the species from Minas Gerais, Brazil (Nogueira et al. 2008), Mato Grosso do Sul, Brazil (Gregorin and Taddei 2000), Costa Rica and Nicaragua (Dolan 1989).

Measurement	Present Study ♀ Bahia	Brazil ♀ Minas Gerais	Brazil ♀ Mato Grosso do Sul	Costa Rica ♀	Nicaragua ♀
FL	46.3	45.0 ± 1.0	43.9 ± 1.5	44.4 ± 0.8	44.5 ± 0.9
GLS	19.8	19.6 ± 0.4	19.4 ± 0.2	20.2 ± 0.4	20.2 ± 0.5
CbL	18.2	17.9 ± 0.3	—	17.8 ± 0.2	18.0 ± 0.5
CcL	18.1	—	—	—	—
PB	4.0	4.3 ± 0.1	—	—	—
BB	10.0	10.1 ± 0.2	9.8 ± 0.1	10.1 ± 0.3	10.1 ± 0.3
ZB	12.3	12.5 ± 0.3	12.4 ± 0.2	—	—
MB	10.8	12.3 ± 0.4	—	—	—
MtL	7.0	7.2 ± 0.1	7.3 ± 0.2	7.0 ± 0.1	7.0 ± 0.3
BaM	8.8	9.0 ± 0.3	9.0 ± 0.2	8.7 ± 0.2	9.0 ± 0.2
BaC	4.8	5.2 ± 0.2	—	5.2 ± 0.1	5.2 ± 0.2

and slightly convergent upper incisors, with tips in contact or not; whereas *M. rufus* has short and spatulated upper incisors, with convergent tips (Fig. 2). The face and membranes are black in *M. rufus* and blackish, slightly paler, in *M. pretiosus* (Gregorin and Taddei 2000, Jennings et al. 2000, Gregorin and Taddei 2002, Nogueira et al. 2008, López-Baucells et al. 2016).

CMARF 0992 is a large specimen, with forearm length (46.4 mm) slightly overlapping with the range reported for *M. rufus*, but still inside the range of *M. pretiosus*. The forearm length of CMARF 0992 is similar with the values documented by Nogueira et al. (2008) for the material from Jaíba, Minas Gerais. Skull measurements are all similar with the values found for females from Costa Rica, Nicaragua, and the Brazilian states of Minas Gerais and Mato Grosso do Sul. Moreover, all the skull measurements are out of the range reported for *M. rufus* (Jennings et al. 2000, Nogueira et al. 2008). The long upper incisors, with separated tips (Fig. 2), are present in the specimen, and were used to distinguish *M. pretiosus* from *M. rufus* (Gregorin and Taddei 2002). However, the importance of this character for species diagnosis was recently contested by Nogueira et al. (2008), who found some differences in the shape of the upper incisors related to specimen sizes (smaller specimens presented short convergent incisors and larger specimens presented long incisors with separated tips). Another relevant character cited by many authors is the color of the face and membranes, which is dark but not black in *M. pretiosus* (as observed in CMARF 0992) and entirely black in *M. rufus* (Lim and Engstrom 2001, Nogueira et al. 2008, López-Baucells et al. 2016).

Discussion

CMARF 0992 constitutes the third record of the species in Brazil, and the first for Bahia state and the Cerrado biome. The others include 1 record in the Pantanal biome (Mato Grosso do Sul; Gregorin and Taddei 2000), and one in the Caatinga biome (Minas Gerais; Nogueira et al. 2008). The new record extends the known distribution range by about 200 km towards the north (Fig. 3). In 2014, a possible specimen of *M. pretiosus* was captured in the same area of study (voucher CMUFLA 900; Guimarães and Ferreira 2014), but due to its difficult identification, the specimen was classified as "*Molossus* cf. *pretiosus*", and the presence of this species in the state was not considered. We captured a possible specimen of *M. pretiosus* in 2014 during fieldwork in the municipality of União de Minas, state of Minas Gerais, which suggested to us the possible presence of this species in the area. However, the individual was released, and there is no voucher material to verify the identity.

The specimen analyzed in this study was captured in an open and dry habitat, condition similar to the data reported on other locations (see Jennings et al. 2000, Lim and Engstrom 2001, Nogueira et al. 2008). According to Dolan (1989), *M. pretiosus* present the most restricted and disjunctive geographical distribution of all congeners. However, the lack on distribution data of *M. pretiosus* in Brazil could be related to a sampling gap instead of the occurrence of any potential geographical barrier (Nogueira et al. 2008). The species is classified as Least Concern in the IUCN Red List of Threatened Species (Pineda and Medina 2008). The study site is classified by Bernard et al. (2011a) as a region deficient in bat inventories and this study reinforces the importance of bat samplings in such areas.

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Authors' Contributions

VCC and SGF collected, analyzed and identified the specimen. VCC prepared the figures. All authors prepared, reviewed and approved the manuscript.

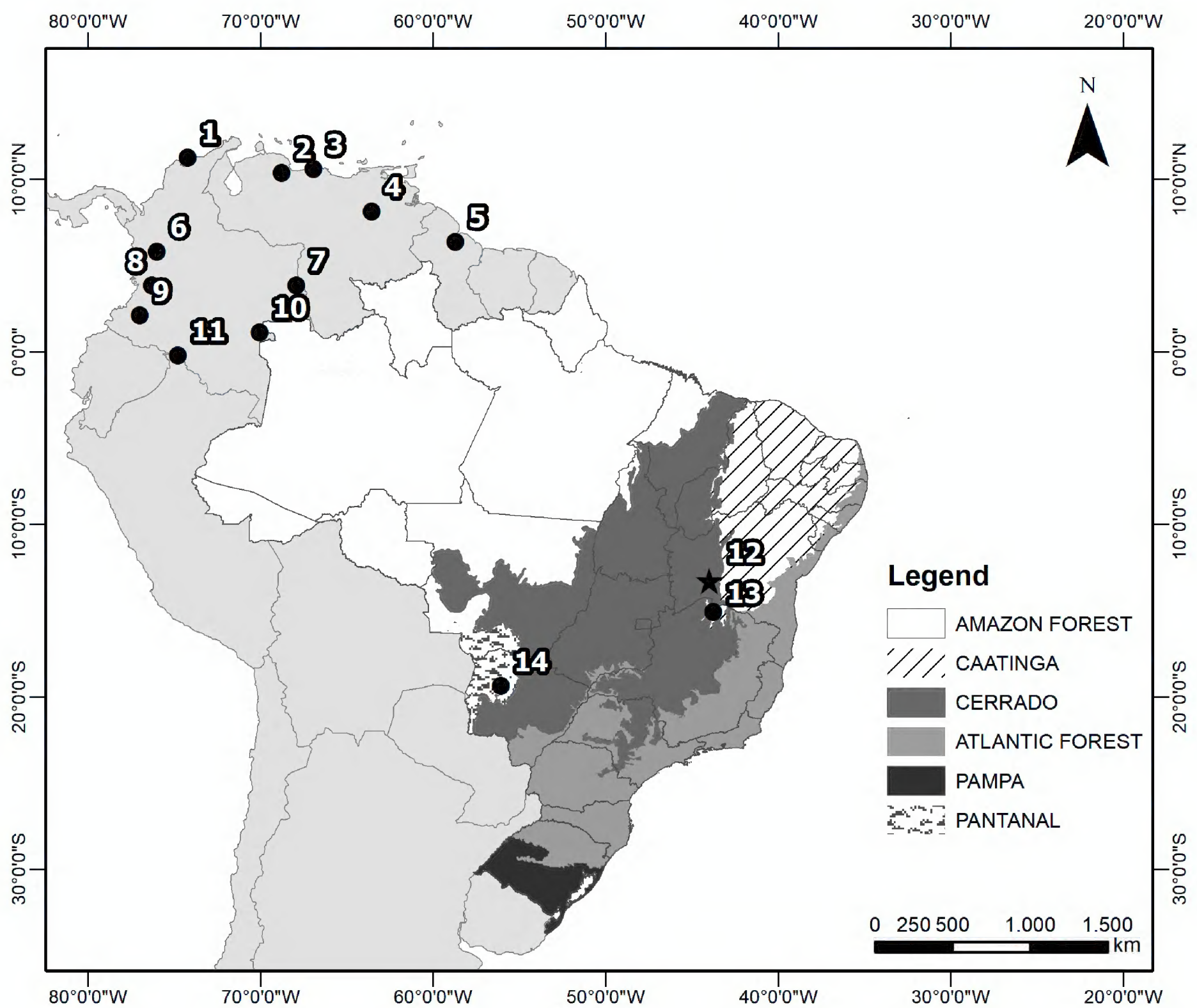

Figure 3. Marginal localities of *Molossus pretiosus* in South America. Black Circles: Previous records for the species; Black Star: Present record from the state of Bahia. Additional information is available in Table 2.

Table 2. Marginal localities of Miller's Mastiff Bat, *Molossus pretiosus* in South America.

Map #	Locality	Latitude	Longitude	Author
1	Santa Marta, Magdalena, Colombia	11°15'N	074°12'W	Eger 2008
2	San Felipe, Yaracuy, Venezuela	10°22'N	068°45'W	García et al. 2014
3	La Guaira, Distrito Federal, Venezuela	10°36'N	066°56'W	Eger 2008
4	Bolívar, Bolívar, Venezuela	08°08'N	063°33'W	Eger 2008
5	Kartabo, Cuyuni-Mazaruni, Guyana	06°23'N	058°41'W	Eger 2008
6	Antioquia, Colombia	05°49'N	075°59'W	Cardona et al. 2016
7	Puerto Inírida, Guainía, Colombia	03°51'N	067°55'W	Marinkelle and Cadena 1972
8	Guadalajara de Buga, Valle Del Cauca, Colombia	03°50'N	076°17'W	Arenas and Giraldo 2013
9	El Bordo, Cauca, Colombia	02°07'N	076°59'W	Eger 2008
10	Mitú, Vaupés, Colombia	01°08'N	070°03'W	Eger 2008
11	Puerto Leguizamo, Putumayo, Colombia	00°12'S	074°46'W	Marinkelle and Cadena 1972
12	São Félix do Coribe, Bahia, Brazil	13°19'S	043°58'W	Present study
13	Jaíba, Minas Gerais, Brazil	15°05'S	043°45'W	Nogueira et al. 2008
14	Aquidauana, Mato Grosso do Sul, Brazil	19°22'S	056°03'W	Gregorin and Taddei 2000

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